STATE OF NEW HAMPSHIRE

INTER-DEPARTMENT COMMUNICATION

DATE June 21, 1989

FROM Thomas F. Cleary
Soils Engineer

AT (OFFICE) NH DOT
Materials & Research

SUBJECT Geotechnical Report (Bridge Only)
U.S. Route 302 over Sawyer River, Br. No. 235/059
Harts Location P-4366, BRF-032-1(20)

TO Ansel Sanborn, Lead Person

Attention: Mark Whittemore

This letter summarizes our geotechnical evaluation and recommendations for the subject project. Information concerning the project was provided by the Bridge Bureau and included 20 scale site plans, roadway profile, boring request plan, hydraulic data and substructure plans for the existing bridge.

Stations referenced hereinafter refer to the Route 302 survey line (500 series).

1. Site Conditions - The project site is located within the White Mountain National Forest along Route 302 in Harts Location, approximately 4 miles north of the Bear Notch Road/Route 302 intersection. The Sawyer River flows in an easterly direction across the site and crosses below Route 302 through a single span, through type, steel plate girder structure. The 1926 design plans for the existing bridge indicate that the superstructure and concrete bridge seat were constructed directly on existing cut stone block abutments from a previous bridge at this site. The stone abutments are most likely supported directly on underlying natural alluvial soils.

   The Sawyer River at this site is approximately 40 ft. wide (normal flow conditions) and was generally less than 2 ft. deep during the spring 1989 exploration program. The river bed is covered with numerous cobbles and large boulders, and ranges in elevation between El. 860 and 862. The ground surface elevation ranges between El. 865 and 870 at the southern abutment and between El. 868 and 874 at the northern abutment.

2. Project Desription - This section summarizes our understanding of the project, based on available information.

   The proposed structure will have 95 ft. long single span with north and south abutments located right of approximately Sta. 500+93 and 501+87, respectively. The proposed structure would be wide enough to accommodate a 12-10 roadway typical. The roadway centerline grade based on the preliminary plans ranges between El. 883 at the north abutment and 881 at the south abutment.

3. Subsurface Explorations - Four test borings (B1 through B4) were conducted at the site by Materials and Research Bureau drill crews during April 1989. Field monitoring of the explorations was provided by Scott Myers, staff Soil Scientist. Standard Penetration Tests (SPT) were conducted within the

explorations utilizing a 2 inch O.D. standard split spoon sampler, driven by a 140 lb. hammer with a 30 inch drop. An NX wireline core barrel and BW casing with a diamond bit were utilized in several cases to advance the test borings through numerous cobbles and boulders.

Logs of the explorations are contained in Appendix A. Test boring locations are plotted on Figure 1.

4. Subsurface Conditions - This section contains our interpretation of subsurface conditions at the site.

Materials at the site which are expected to affect the proposed construction consist of the following strata, proceeding downward from the ground surface:

- Miscellaneous Fill
- Alluvial Deposit

It is expected that glacial till and bedrock which were not sampled in the explorations underlie the the above strata. Any one of the above strata may be absent at specific locations in the field.

Miscellaneous fill at the site is expected to consist of existing abutment and backfill materials which were placed during the original roadway and bridge construction. It is likely that the substructure of the existing abutments extends several feet below the adjacent river bed.

The natural alluvial deposit at the site is expected at the ground surface or immediately below any surficial fill or abutment materials. The alluvial deposit, which was not fully penetrated by the explorations, was sampled down to between El. 840 and 845 in the explorations. The thickness of the deposit ranged up to 34 feet, prior to terminating the explorations. The alluvial deposit was described as a medium dense to very dense gravelly sand to silty fine sand, with intermixed cobbles and boulders. Continuous layers of cobbles and boulders were also penetrated by the explorations. Boulders were absent within B2 below El. 864.

Groundwater at the site is expected to be influenced primarily by the water level of the Sawyer River and by infiltration from precipitation and runoff. During the spring exploration program, the groundwater level ranged between El. 861 and 864. The Q-50 and Q-100 elevations for the Sawyer River are understood to be El. 866.8 and 867.1, respectively. The design velocity at the bridge site is understood to be 16.4 FPS.

5. Engineering Evaluation and Recommendations - This section summarizes our geotechnical evaluation and recommendations for the bridge foundation.

It is recommended that a spread footing be utilized for the north and south abutment foundations. The spread footing should be supported by the naturally deposited, undisturbed alluvial deposit at a maximum allowable bearing pressure of 3 TSF. Miscellaneous fill is not considered acceptable for support of the proposed footing and should be completely removed down to the surface of the recommended support materials.

It is recommended that a footing bearing elevation be selected which would minimize the amount of excavation through the bouldery alluvial deposit and also reduce excavation depths below river level. Based on preliminary design information, an approximate bearing grade of El. 860 is recommended.

Due to the high river velocities at this site, scour protection would be required. It is recommended that a steel sheet pile curtain wall extending several feet (i.e. 6 ft. minimum) below the footing bearing elevation, along with stone fill in front of and alongside the abutments be utilized. A vibratory hammer is recommended for installing the steel sheeting through the alluvial deposit. This type of hammer was successful in driving sheeting through similar materials for the River Street/Saco River bridge project in Bartlett. In the event that the sheeting could not be driven to the necessary depth, pre-excavation of boulder materials would be required. Areas below the footing which are pre-excavated should be backfilled with compacted structural fill.

Additional general foundation recommendations include the following:

- Footings should be established a minimum of 5 ft. below the lowest adjacent final ground surface for frost protection.

- Limits of miscellaneous fill removal should include the zone defined by a 1H:2V line projected downward and outward to the surface of the recommended support soils from points located 2 feet beyond the outer edge of footing. Miscellaneous fill removed within the recommended limits should be replaced with structural fill, placed and compacted in accordance with section 508.

- A minimum 18 inch layer of compacted structural fill is recommended below the entire footing in order to provide more uniform bearing conditions across the expected boulder materials, and to provide a more stable working surface under wet conditions.

- Crushed stone materials which are substituted for structural fill to improve dewatering conditions should meet the gradation requirements for 3/4 inch coarse aggregate for pavement (section 401, Table 1).

- The excavation to the final grade and the control of groundwater should be conducted in such a manner as to prevent the disturbance of the bearing soils. Pumping equipment should be properly filtered to prevent loss of fines. Any disturbed bearing areas should be overexcavated and replaced with compacted structural fill.

- Protruding boulders or cobbles encountered at the final excavation level should be either removed or split to provide a level bearing surface and to prevent localized stress distribution at the base of the footing.

If you have any questions or require additional information, please contact us.

Sincerely,

Thomas F. Cleary

Thomas F. Cleary, P.E.
Soils Engineer

enclosures: 1. Figure 1 - Subsurface Exploration Plan
2. Appendix A - Test Boring Logs B1 through B4

cc: A. Sanborn, Lead Person (Text Only)
R. Moody, Construction Bureau